

WHAT IS CLAIMED IS:

- 1 1. An automated detection algorithm to compute the ring profile of colon
2 like surfaces comprising the steps of:
3 providing an original image of a colon like surface disposed along a major
4 axis in a scan having vertex points, each vertex point having a discrete point identifier and
5 three dimensional position information;
6 generating a thin version of the colon like surface utilizing neighbors
7 averaging of the three dimensional position information for every vertex point in the original
8 colon view;
9 modeling the thin version of the colon like surface with an ordered set of 3-D
10 points to produce a curve proximate to the major axis of the colon like surface;
11 isolating segments of vertex points (along) between planes normal to the curve
12 proximate to the major axis of the colon from the thin version of the colon like surface;
13 mapping the isolated segments of vertex points from the thin version of the
14 colon like surface back to the original image of the colon like surface to generate a ring
15 profile of the colon like surface.
- 1 2. The automated detection algorithm to compute the ring profile of colon
2 like surfaces according to claim 1 comprising the steps of:
3 decimating the vertex points of the provided original image.
- 1 3. The automated detection algorithm to compute the ring profile of colon
2 like surfaces according to claim 1 comprising the steps of:
3 computing a centerline of the colon utilizing the ring profile of the colon like
4 surface.
- 1 4. The automated detection algorithm to compute the ring profile of colon
2 like surfaces according to claim 3 comprising the steps of:
3 measuring along the computed centerline of the colon like surface to
4 determine positional information relative to the colon like surface.
- 1 5. The automated detection algorithm to compute the ring profile of colon
2 like surfaces according to claim 3 comprising the steps of:
3 computing a smoothed version of the centerline of the colon to approximate
4 centerlines obtained by invasive colonoscopy.

1 6. The automated detection algorithm to compute the ring profile of colon
2 like surfaces according to claim 3 comprising the steps of:

3 utilizing the ring profile along a preselected length of the computed colon
4 centerline to determine the local colon volume and local colon distension along the
5 preselected length of the colon.

1 7. The automated detection algorithm to compute the ring profile of colon
2 like surfaces according to claim 3 comprising the steps of:

3 mapping the vertices distance to the computed centerline; and,
4 building an image of vertices distances to centerline to map the colon.

1 8. The automated detection algorithm to compute the ring profile of colon
2 like surfaces according to claim 3 comprising the steps of:

3 mapping the vertices distance to the computed centerline to obtain a mapped
4 centerline view of the colon;

5 rotating the mapped centerline view of the colon to spatially reorient the
6 mapped centerline view of the colon; and,

7 reconstructing a spatially reoriented image of the colon from the rotated
8 centerline view by expanding the vertices distances to map the colon.

1 9. An automated detection algorithm to compute the ring profile of colon
2 like surfaces comprising the steps of:

3 providing an original image of the colon like surfaces disposed along a major
4 axis in a scan having the colon like surface identified by vertex points, each of vertex point
5 having a discrete point identifier and three-dimensional positional information;

6 generating a thinned image of the colon like surface utilizing a neighbors
7 averaging of the three-dimensional positional information for vertex points in the original
8 colon view;

9 randomly designating a first vertex modeling point at a vertex point along the
10 thinned the colon image;

11 identifying and marking neighboring vertex points to the randomly selected
12 first vertex modeling point;

13 designating a second vertex modeling point located at a predetermined
14 distance from the first of vertex modeling point;

15 sequentially repeating the identifying and marking, and designating steps to
16 designate vertex modeling points from the randomly selected first vertex modeling point to
17 an end of the colon;
18 connecting the designated vertex modeling points to produce a curve
19 proximate to the major axis of the colon like surface;
20 isolating groups of vertex points between planes normal to the curve from the
21 thin image of the colon like surface; and,
22 mapping the isolated groups of a vertex points from the thinned image of the
23 colon like surface back to the original image of the colon like surface to generate a ring
24 profile of the colon like surface.

1 10. An automated detection algorithm to compute an approximate
2 centerline profile of colon like surfaces comprising the steps of:
3 providing an original image of the colon like surfaces disposed along a major
4 axis in a scan having the colon like surface identified by vertex points, each of vertex point
5 having a discrete point identifier and three-dimensional positional information;
6 generating a thinned image of the colon like surface utilizing a neighbors
7 averaging of the three-dimensional positional information for vertex points in the original
8 colon view;
9 randomly designating a first vertex modeling point at a vertex point along the
10 thinned the colon image;
11 identifying and marking neighboring vertex points to the randomly selected
12 first vertex modeling point;
13 designating a second vertex modeling point located at a predetermined
14 distance from the first of vertex modeling point;
15 sequentially repeating the identifying and marking, and designating steps to
16 designate vertex modeling points from the randomly selected first vertex modeling point to
17 an end of the colon;
18 connecting the designated vertex modeling points to produce a curve
19 proximate to the major axis of the colon like surface.

1 11. An automated detection algorithm to compute the ring profile of colon
2 like surfaces comprising the steps of:

3 providing an original image of the colon like surfaces disposed along a major
4 axis in a scan having the colon like surface identified by vertex points, each of vertex point
5 having a discrete point identifier and three-dimensional positional information;

6 generating a thinned image of the colon like surface utilizing a neighbors
7 averaging of the three-dimensional positional information for vertex points in the original
8 colon view;

9 randomly designating a first vertex modeling point at a vertex point along the
10 thinned the colon image;

11 identifying and marking neighboring vertex points to the randomly selected
12 first vertex modeling point;

13 designating a second vertex modeling point located at a predetermined
14 distance from the first of vertex modeling point;

15 sequentially repeating the identifying and marking, and designating steps to
16 designate vertex modeling points from the randomly selected first vertex modeling point to
17 an end of the colon;

18 connecting the designated vertex modeling points to produce a curve
19 proximate to the major axis of the colon like surface;

20 isolating groups of vertex points between planes normal to the curve from the
21 thin image of the colon like surface; and,

22 mapping the isolated groups of a vertex points from the thinned image of the
23 colon like surface back to the original image of the colon like surface to generate a ring
24 profile of the colon like surface.

1 12. An automated detection algorithm to compute an approximate
2 centerline profile of colon like surfaces comprising the steps of:

3 providing an original image of the colon like surfaces disposed along a major
4 axis in a scan having the colon like surface identified by vertex points, each of vertex point
5 having a discrete point identifier and three-dimensional positional information;

6 generating a thinned image of the colon like surface utilizing a neighbors
7 averaging of the three-dimensional positional information for vertex points in the original
8 colon view;

9 randomly designating a first vertex modeling point at a vertex point along the
10 thinned the colon image;

11 identifying and marking neighboring vertex points to the randomly selected
12 first vertex modeling point;
13 designating a second vertex modeling point located at a predetermined
14 distance from the first of vertex modeling point;
15 sequentially repeating the identifying and marking, and designating steps to
16 designate vertex modeling points from the randomly selected first vertex modeling point to
17 an end of the colon;
18 connecting the designated vertex modeling points to produce a curve
19 proximate to the major axis of the colon like surface.